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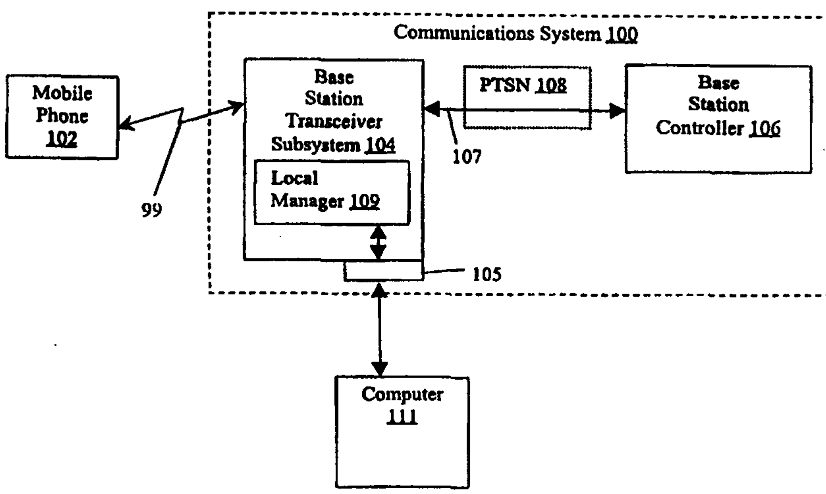

(57) Abstract

A base station transceiver subsystem in a mobile communications environment is configured in the field through a local laptop computer. The computer accesses local management software in the subsystem to input configuration information. The local manager executes the configuration information without interaction or support of a base station manager connected to the subsystem through the backhaul. Web browser software within the computer facilitates communication with the local manager through TCP/IP or Ethernet interfaces. The subsystem can include a server with configuration scripts that respond to user inputs at the computer. The subsystem is tested, locally, by implementing local calls and/or by tying a loopback line between backhaul ports of the subsystem. A variety of tests and configurations can thus be made locally, including evaluating backhaul functionality, and without the need for a Base Station Controller and an associated BSM.

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CONFIGURATION OF A BASE STATION TRANSCEIVER SYSTEM IN A MOBILE COMMUNICATION SYSTEM

BACKGROUND OF THE INVENTION

Related Applications

This application is a continuing application of commonly-owned and co-pending U.S. Provisional Application No. 60/075,584, filed on February 23, 1998 and herein incorporated by reference.

I. Field of the Invention

The present invention relates to mobile communications, and in particular to configuring a base station transceiver system.

II. Description of the Related Art

The prior art is familiar with telecommunication networks that include a Network Operations Center ("NOC"), a Public Switch Telephone Network ("PSTN"), and a Base Station Transceiver Subsystem ("BTS") to communicate to cellular phones. FIG. 1 illustrates one such prior art telecommunications network 10, including NOC 12, PSTN 14, and BTS 16, connected together by cable 18. Cable 18 typically provides T1, E1 or multiple communication protocols and is sometimes referred to as the "backhaul." As illustrated, network 10 communicates with a cellular phone 20 through the BTS 16 with over-the-air protocol 22, known in the art.

NOC 12 is the main control center for network 10. NOC 12 includes Base Station Management ("BSM") 12a to provide for evaluation and control of network operations, and to configure BTS 16. PSTN 14 typically represents a switching network of the regional phone company, e.g., US WEST in Colorado.

Several types of network communication may exist in network 10. By way of example, Qualcomm Incorporated utilizes Code Division Multiple Access ("CDMA"), known in the art, for communications within certain

telecommunications networks. Those skilled in the art should appreciate that other companies involved in similar telecommunications networks utilize other communication protocols.

One problem with network 10 is that BTS 16 cannot be configured, effectively, from BSM 12a and through cable 18 since PSTN 14 can control and stop communications between BSM 12a and BTS 16. By way of example, if PSTN 14 interrupts service between BSM 12a and BTS 16, caused by hardware or software error within the local exchange, BTS 16 can no longer be controlled by BSM 12a.

A special set-up is sometimes used to configure, commission and/or monitor the BTS 16 through the BSM 12a. In these processes, BTS 16 is coupled to BSM 12a through a dedicated separate line. BTS 16 is relocated near to the BSM 12a to facilitate connection with the separate line. The separate line creates additional problems and adds an unwanted step and time to the BTS configuration process. Furthermore, backhaul 18 is not simultaneously tested with BTS 16, even though this is also desirable. Rather, to test backhaul 18, a T1 analyzer is used at the location of BTS 16, adding yet another unwanted process step and associated time to configure BTS 16.

Communication networks would thus benefit from systems and methods which permit testing, configuration and/or monitoring of the BTS in the field and without the need for a BSM or a backhaul; and one object of the invention is to provide such systems and methods.

Another object of the invention is to provide methods and systems for testing the BTS in the field to simultaneously test backhaul operability in different modalities.

These and other objects will become apparent in the description that follows.

SUMMARY OF THE INVENTION

The following U.S. Patents provide useful background and information for the invention and are thus incorporated herein by reference: U.S. Patent No. 5,781,856; U.S. Patent No. 5,697,055; U.S. Patent

No. 5,640,414; U.S. Patent No. 5,594,718; U.S. Patent No. 5,584,049; U.S. Patent No. 5,475,870; U.S. Patent No. 5,267,261; and U.S. Patent No. 5,625,876.

The present invention is a novel and improved method of configuring a base station transceiver subsystem in a mobile communications environment. In one aspect of the invention, the method includes the steps of: connecting a computer, preferably a laptop computer, to the base station transceiver subsystem; accessing local management software in the subsystem; inputting configuration information to the subsystem using the computer; and executing the configuration information to configure the subsystem. The local management software is sometimes referred to herein as a "local manager" and can take the form of a software component residing in the BTS to manage, configure, enable and/or disable various components or subsystems of the BTS.

In another aspect, the step of connecting includes connecting a computer with a web browser to the subsystem. As such, the step of accessing local management software can be accomplished through the web browser.

In another aspect, the step of inputting configuration information includes utilizing the web browser to input the information. Further, the step of accessing local management software can include accessing a server in the subsystem.

In yet another aspect, executing configuration information can include the step of executing scripts in the server.

In one aspect, accessing local management software includes accessing a local manager through a serial interface.

In still another aspect, accessing local management software includes the step of connecting the computer to the subsystem through a PPP connection over the serial interface.

In still another aspect, the step of connecting includes connecting the computer to the subsystem through an ethernet port.

The methods of the invention can include testing backhaul functionality from the computer, including: (a) connecting a communications link between the backhaul port and a second port in the

base station transceiver subsystem, and (b) generating frames on the link for evaluation at the computer, such as through a web browser. The communications link can be, for example, a T1, E1 or T3 cable, a micowave link, or a fiber-optic link.

Other methods for testing backhaul functionality from the computer include: (a) connecting a communicaitons link between the backhaul port and the BSM, and (b) generating frames on the link for evaluation at the computer, such as through a web browser.

In other aspects, testing methods of the invention can include the step of verifying CDMA parameters, evaluating BSM functionality, and/or evaluating backhaul functionality.

In one aspect, the BTS of the invention provides two interfaces, a web interface and a low-level shell interface. The web interface provides html or icon-based interface to the BTS; and the low-level interface provides command-line interface to the BTS.

One preferred aspect of the invention includes activating or deactivating subsystems within the BTS. One other testing aspect includes generating calls, such as Markov calls, through the computer to evaluate subsystem functionality. The methods of the invention can further include adjusting digital gains, through the computer, to adjust CDMA channel strengths.

The invention also provides, in another aspect, a system for configuring a base station transceiver subsystem through a computer. The system includes a base station transceiver subsystem with a computer interface. A computer connects to the interface and a local manager, within the subsystem, implements configuration commands from the computer. Preferably, the computer has a web browser responsive to user inputs to configure the base station transceiver subsystem. The interface between the web browser and the subsystem can for example be an ethernet port or a serial (e.g., RS-232) port. The subsystem preferably has both interfaces. Either interface can utilize IP, TCP and UDP standard protocols to facilitate communication between the computer and the local manager. The serial interface may run PPP to support transfer of IP packets.

In yet another aspect, the invention provides a locally configurable base station transceiver system. A computer port provides access to the subsystem via a local computer with web browser software. A local manager, responsive to the web browser, configures the subsystem according to user commands at the computer.

BRIEF DESCRIPTION OF THE DRAWINGS

The features, objects, and advantages of the present invention will become more apparent from the detailed description set forth below when taken in conjunction with the drawings in which like reference characters identify correspondingly throughout and wherein:

FIG. 1 is a depiction of a prior art telecommunications network;

FIG. 2 is a schematic illustration of a telecommunications system constructed according to the invention and communicating to a mobile phone;

FIG. 3 is a schematic illustration of a system constructed according to the invention for configuring a BTS in a mobile telecommunications network;

FIG. 4 is a schematic diagram of one BTS constructed according to the invention; and

FIG. 5 is a schematic diagram of another BTS constructed according to the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention overcomes the above-described problems of the prior art by providing a computer and/or web-based interface to configure a BTS in the field. FIG. 2 depicts a communications system 100 of the invention, and a mobile phone 102. Communications system 100 includes a BTS 104 connected to a base station controller 106. Communications system 100 can further include a PTSN 108. Controller 106 can contain a BSM such as BSM 12a, FIG. 1. BTS 104 communicates to base station controller 106 over

backhaul 107. In operation, mobile phone 102 communicates with BTS 104, and BTS 104 communicates with base station controller 106. In one preferred embodiment, the air interface 99 of communications system 100 operates in accord with IS-95, the specification approved by the Telecommunications Industry Association ("TIA") for CDMA communications and incorporated herein by reference. Backhaul 107 supports other interfaces and standards.

BTS 104 has a computer access port 105 used to access internal software and logic, identified as local manager 109, within BTS 104. Local manager 109 has similar function to BSM 12a, FIG. 1, to manage and configure BTS 104. By connecting a computer 111 to port 105, a field engineer locally configures and tests BTS 104 and backhaul 107, as described in more detail below.

Those skilled in the art should appreciate that backhaul 107 can take several forms within the scope of the invention. For example, backhaul 107 can be a T1, E1 or T3 cable, a microwave link, or a fiber optic (e.g., OC3) connection.

FIG. 3 depicts BTS 104', constructed according to the invention and similar to BTS 104, FIG. 2. FIG. 3 shows BTS 104' connected to a laptop computer 110; and BTS 104' preferably includes an Ethernet port 104a for this purpose. Those skilled in the art should appreciate that other interfaces can be used to provide similar connectivity, such as serial port 123.

In the preferred embodiment of the invention, Ethernet port 104a logically couples to transaction control protocol/internet protocol ("UDP/TCP/IP") interface 116. Interface 116 logically couples to server 118, which implements functional scripts 120.

BTS 104' also preferably includes serial port 123, such as an RS-232 interface, used as another mode to connect computer 110 to BTS 104'. In this embodiment, BTS 104' includes Point-to-Point Protocol ("PPP") interface 122 logically coupled to local manager 114 and port 123. Local manager 114 can also be accessed through interface 116 via the telnet application and protocol 133.

The above interfaces thus provide access to local manager 114 via PPP and Ethernet protocols. BTS 104' may thus connect to outside applications via UDP/IP or TCP/IP protocols. FIG. 3 illustrates these connections to laptop computer 110 as items 121a and 121b. Accordingly, application specific software may access internal BTS values via techniques well defined within the art. For example, a Java applet can be stored within web pages which access the frame error rate for a specific call. The applet then transfers the data to laptop computer 110 via UDP from BTS 104'.

In the preferred embodiment of the invention, laptop computer 110 includes a web browser 112. The web browser 112 and laptop computer 110 can be of conventional design and known in the art. Likewise, interfaces 104a, 116, and 122 are known in the art. Server 118 can be adapted, for example, from a Hyper-Text Transfer Protocol ("HTTP") server such as the Apache server provided by the Apache Group. Server 118 can for example implement Common Gateway Interface ("CGI") scripts 120 known in the art. CGI scripts 120 can also be extended as function calls within BTS software.

In operation, a field engineer plugs laptop computer 110 into BTS 104' using interfaces 121a or 121b to communicate with BTS 104'. This communication provides access to the local manager 114, through laptop 110, to issue management commands to BTS 104'. Commands from local manager 114 are similar in operation to commands from a BSM at the Network Operating Center. Specifically, BTS 104' responds to management commands from either the controller 106, through backhaul 107, or from the local manager 114. FIG. 3 also shows a T1 port 109 used to connect backhaul 107 to BTS 104'.

BTS 104' can be configured through interface 116 and server 118. To configure and/or issue management commands to BTS 104' through server 118, web browser 112 accesses server 118 through interfaces 104a and 116. Server 118 provides a series of screens (e.g., web pages) to the field engineer, at computer display 110a, that prompt the engineer for configuration information. For example, one screen can for example prompt the field engineer to input a Global Position system ("GPS") receiver location. Server 118 then executes scripts 120 to configure BTS 104' in accord with the

field engineer's inputs. The above process can also be accomplished using serial port 123, PPP 122, UDP/TCP/IP 116, server 118, and scripts 120.

As noted above, the field engineer can alternatively input configuration commands directly to shell local manager 114 though serial interface 123; and shell manager 114 executes these commands to configure BTS 104'.

The invention of FIGs. 2 and 3 thus permits configuration of a BTS without a BSM and/or a separate T1 line, as in the prior art. Furthermore, testing to a local mobile phone 130 can be made on location through the BTS antenna 124, by commanding BTS 104' to radiate over-the-air protocol 132 to phone 130. More particularly, through local computer 110, BTS 104' can be commanded to place phone calls locally. For example, a Markov phone call (a CDMA technique known in the art) can be used as protocol 132 to test the BTS set-up without extra infrastructure.

In one embodiment, laptop computer 110 stores a configuration file on a hard drive or floppy disk 110b. Laptop computer 110 transfers the configuration file to BTS 104' for configuration purposes. Laptop computer 110 can also retrieve a configuration file from one BTS and transfer it to another BTS for configuration. Further, specific configuration data can be retrieved from BTS 104' and transferred to the BSM after BTS 104' is installed.

In a further embodiment, a BTS of the invention includes two backhaul ports 152a, 152b, as shown in FIG. 4. Backhaul ports 152a, 152b can be tested by a connected computer 154, such as computer 110, FIG. 3. Computer 154 connects to BTS 150 through a cable 121' (or other data connection, e.g., an RF or microwave connection) and computer interface 151. Computer interface 151 can take the form of an Ethernet port or serial port, such as described above.

FIG. 4 shows two alternative connections 107', 153 to backhaul ports 152a and 152b. In the first optional configuration, backhaul 107' may be connected to the base station controller (e.g., controller 106, FIG. 2); and backhaul connection 107' may be validated from port 152a to the base station controller. This configuration also verifies the function of PSTN 108, FIG. 2,

as well as port 152a; and this test is run from connected computer 154 using the local manager or web interface. In the second optional configuration, backhaul ports 152a and 152b are validated using connected computer 154 with the addition of the loopback cable 153. Loopback cable 153 can take the form of a T1 line, though other communication interfaces including T3, E1, optical and microwave can function as loopback cable 153. As before, the local manager and web interface display the status of this test and control its operation.

In that the above loopback tests can be initiated from the web interface and that the statistics of these tests can be displayed on the web interface, it should be apparent that BTS 150 permits loopback tests without a separate T1 analyzer, as in the prior art. A field engineer at BTS 150 can thus locally determine whether a cable, backhaul, port or BSM are faulty.

Most configurations of the BTS can still be made from the BSM, i.e., from the NOC 106 using backhaul 107, FIG. 1; but the field engineer can also connect directly to the BTS through a local port, e.g., port 152b, FIG. 4, and ports 104a or 123, FIG. 3.

Many test scenarios and configurations can be tested and/or implemented through the inventions of FIGs. 2-4, as should be apparent to those in the art. By way of example, the subsystem status of the BTS can be modified through laptop computer 110, FIG. 3, to activate or deactivate certain components or controls of the BTS. As known in the art, this may include control panel items, actions and values, timing and/or other parameters that are heretofore only managed through the BSM. With the invention, BTS subsystem status can be modified in the field. The invention also permits testing and analysis of bit errors associated with monitoring calls, all from the BTS operational location. Since BTS attributes can be modified in the field, the BTS is also readily configured to improve operability, such as through modification of BTS digital gains. By modifying the digital gains, for example, the relative strengths between CDMA channels can be adjusted to ensure proper reception of the pilot channel at the field location. Prior to the invention hereof, such

modification was limited by restrictions through the BSM and the line connecting the BSM to the BTS, and the availability of a functional BSC.

FIG. 5 shows a schematic illustration of one BTS 200 constructed according to the invention. BTS 200 is a single carrier, single sector BTS operating in the PCS band and conforming to ANSI J-STD-008 specifications for CDMA base stations. BTS 200 is packaged for indoor and outdoor use, and may be mounted on walls or poles or at cell-block locations. With internal software and logic, BTS 200 provides network management, backhaul traffic processing, GPS derived timing and frequency control, RF power control and T1/E1 backhaul management, among other functions. BTS 200 has a digital CCA 202, an RF upconverter CCA 204, an RF downconverter CCA 206, a timing and frequency CCA 208, an I/O subsystem 210, and an RF subsystem 212. Logical connections and data flow through items 202-212 are shown in FIG. 5 in the form of arrows. Digital CCA 202 is the main processor which coordinates BST functions. CCA 202 preferably includes a Markov generator 202a to generate and receive traffic frames and to collect statistics. RF upconverter CCA 204 takes baseband I and Q signals and modulates them to PCS frequencies. RF downconverter CCA 206 receives RF and demodulates it into I and Q signals. Timing and frequency CCA 208 generates various frequencies for proper operation of the CDMA base station. CCA 208 interfaces with a GPS receiver 211 to assure synchronization with other BSTs. I/O subsystem 210 provides I/O ("input/output") interconnects, surge protection, and power supplies. And RF subsystem 212 provides LNA and transmit filters, surge protection, and external RF I/O connections.

Those skilled in the art should appreciate that FIG. 5 illustrates one detailed representation of a BTS of the invention and that certain modifications can be made without departing from the scope of the invention. By way of example, BTS 200 can also support multiple frequency assignments and multiple sectors. BTS 200 can also support BTS configurations which include a local manager and a web browser or other computer interfaces in the field, such as described above.

BTS 200 supports HTML formats allowing access and manipulation of attributes, actions and events through a local management web interface, e.g., providing access to a computer and web browser 110, 112, FIG. 3. The web interface can use an Ethernet port 104a or serial port 123, FIG. 3, known in the art, to provide access to BTS 200. BTS 200 also supports lower-level access such as through a shell interface.

The previous description of the preferred embodiments is provided to enable any person skilled in the art to make or use the present invention. The various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other embodiments without the use of the inventive faculty. Thus, the present invention is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope consistent with the principles and novel features disclosed herein.

I (WE) CLAIM:

CLAIMS

1. A method of configuring a base station transceiver subsystem in a mobile communications environment, comprising the steps of:
connecting a computer to the base station transceiver subsystem;
accessing local management software in the subsystem;
inputting configuration information to the subsystem using the computer; and
executing the configuration information to configure the subsystem.

2. A method according to claim 1, wherein the step of connecting a computer comprises connecting a computer with a web browser to the subsystem.

3. A method according to claim 2, wherein the step of accessing local management software comprises accessing a server using the web browser.

4. A method according to claim 2, wherein the step of inputting configuration information comprises using the web browser to input the information.

5. A method according to claim 2, wherein the step of accessing local management software comprises accessing a server in the subsystem.

6. A method according to claim 5, wherein the step of executing the configuration information comprises executing scripts in the server.

7. A method according to claim 5, further comprising the step of executing function calls upon the server.

8. A method according to claim 2, wherein the step of connecting comprises connecting a laptop computer to the subsystem.

9. A method according to claim 1, wherein the step of accessing comprises accessing a local manager through a serial interface.

10. A method according to claim 9, wherein the step of accessing comprises accessing the local manager through a PPP connection over the serial interface.

11. A method according to claim 1, wherein the step of accessing comprises accessing a local manager through telnet.

12. A method according to claim 11, wherein the step of accessing comprises accessing telnet via TCP/IP.

13. A method according to claim 12, wherein the step of accessing comprises accessing TCP/IP via Ethernet.

14. A method according to claim 12, wherein the step of accessing comprises accessing TCP/IP via PPP.

15. A method according to claim 14, wherein the step of connecting via PPP comprises accessing through a serial port.

16. A method according to claim 1, wherein the step of connecting comprises connecting the computer to the subsystem through an Ethernet port.

17. A method of claim 1, further comprising the step of testing the subsystem, the step of testing comprising (a) connecting a communications link between the backhaul port and a second port of the subsystem, and (b) generating frames on the link for evaluation at the computer.

18. A method of claim 1, further comprising the step of testing backhaul functionality from the computer, comprising (a) connecting a communications link between the backhaul port and a BSM, and (b) generating frames on the link for evaluation at the computer.

19. A method of claim 1, further comprising the step of verifying air interface parameters.

20. A method of claim 1, further comprising the step of evaluating subsystem functionality.

21. A method of claim 1, further comprising the step of evaluating backhaul functionality.

22. A method of claim 1, further comprising activating or deactivating subsystem components within the subsystem.

23. A method of claim 1, further comprising generating calls, through the computer, to evaluate subsystem functionality.

24. A method of claim 1, further comprising adjusting digital gains, through the computer, to adjust channel strengths.

25. A system for configuring a base station transceiver subsystem through a computer, comprising:

a base station transceiver subsystem having a computer access port;

a local manager, connected to the port, for implementing configuration commands from the computer; and

a computer connected to the port for communication with the local manager, the computer being responsive to user inputs to configure the base station transceiver subsystem.

26. A system according to claim 25, wherein the computer comprises a laptop computer.

27. A system according to claim 25, wherein the subsystem comprises a server connected to the port, the server storing scripts and being responsive to the computer to implement the scripts in configuration of the subsystem.

28. A system according to claim 25, further comprising a UDP/TCP/IP protocol stack.

29. A system according to claim 25, wherein the port comprises a serial port and further comprising PPP protocol for the serial port.

30. A system according to claim 25, further comprising a telnet application for communicating with the local manager.

31. A system according to claim 25, further comprising means for connecting applications outside the subsystem via TCP/IP and UDP/IP.

32. A locally configurable base station transceiver system, comprising:

a computer port for accessing the subsystem with a local computer, the computer having web browser software; and

a local manager, responsive to the web browser, for configuring the subsystem according to user commands at the computer.

33. A system of claim 32, further comprising a digital CCA, the local manager operating within the digital CCA.

34. A system of claim 33, wherein the digital CCA comprises a call generator for generating calls in response to user inputs at the computer.

35. A system of claim 32, further comprising an RF upconverter for modulating I and Q signals to radio frequencies.

36. A system of claim 32, further comprising an RF downconverter for receiving RF signals and demodulating the RF signals to I and Q signals.

37. A system of claim 32, further comprising a timing and frequency CCA for generating radio frequencies.

38. A system of claim 32, further comprising an I/O subsystem for providing one or more of I/O interconnections, surge protection and power supply.

39. A system of claim 32, further comprising an RF subsystem for providing one or more of LNA and transmit filters, surge protection, and external RF I/O connections.

FIG. 1 (PRIOR ART)

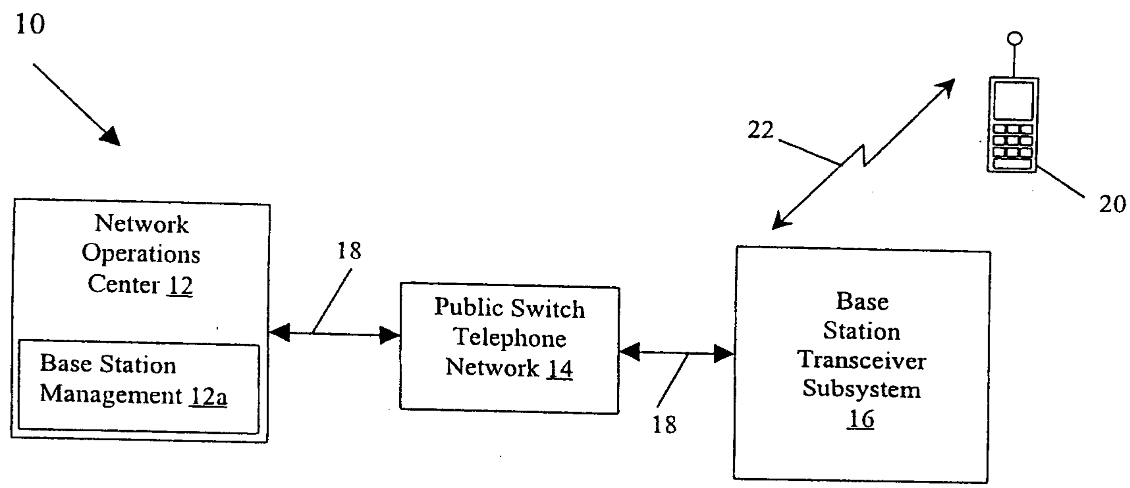


FIG. 2

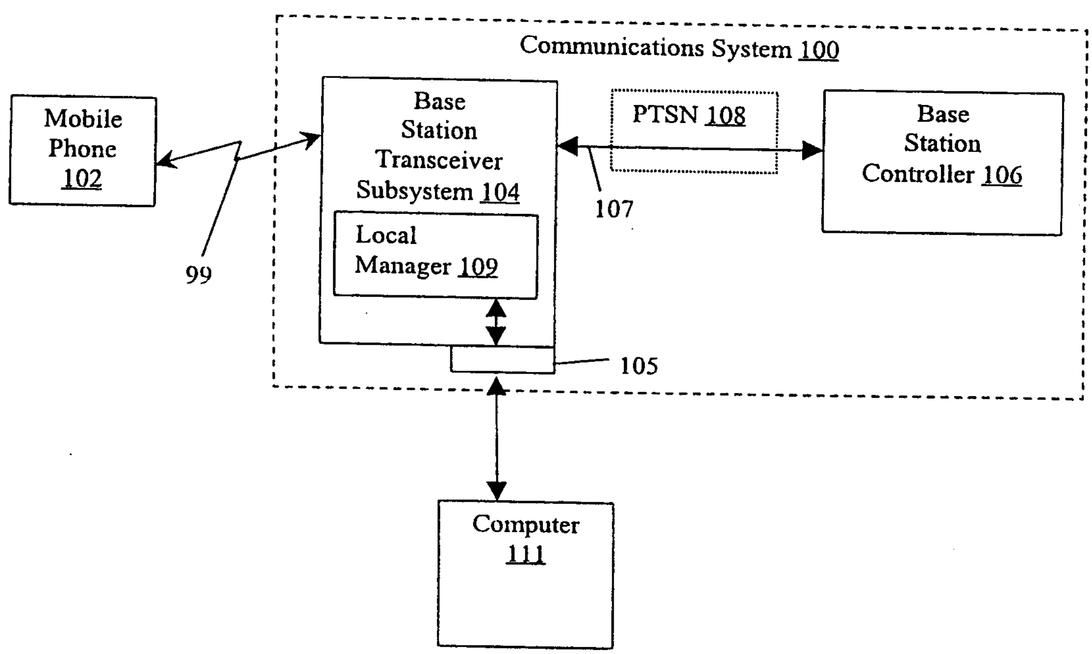
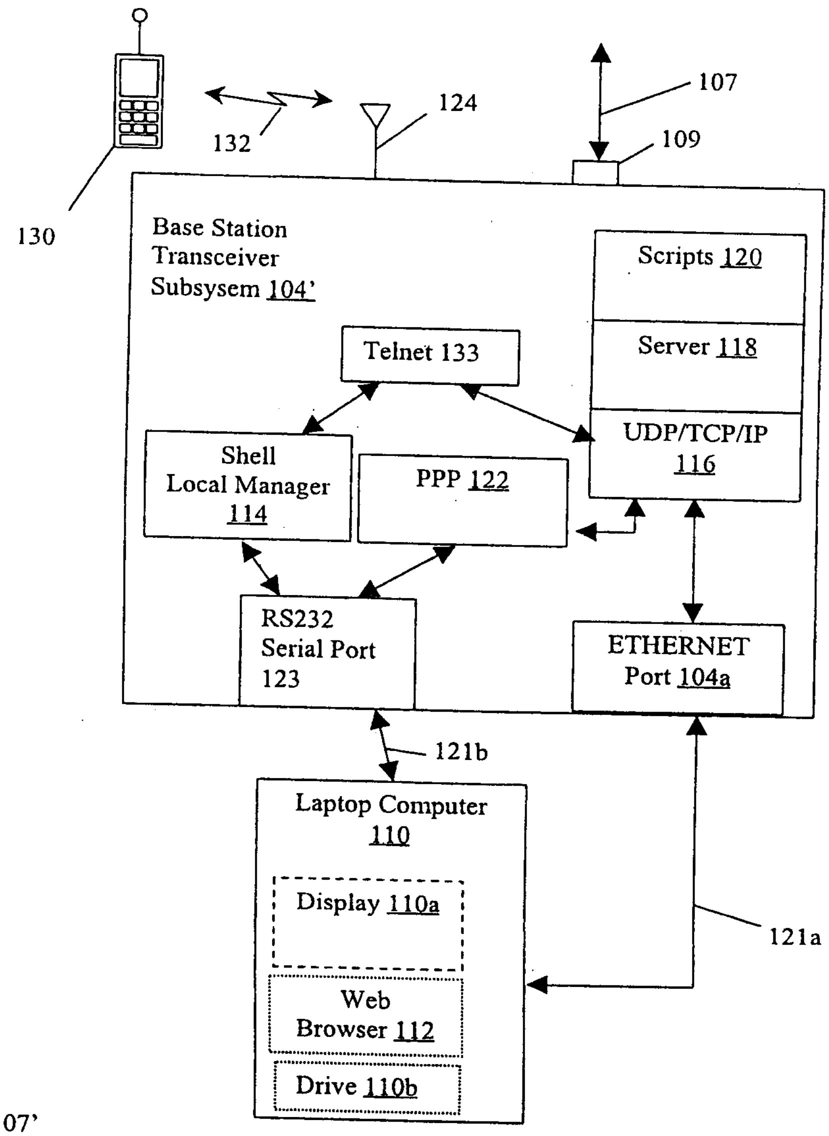
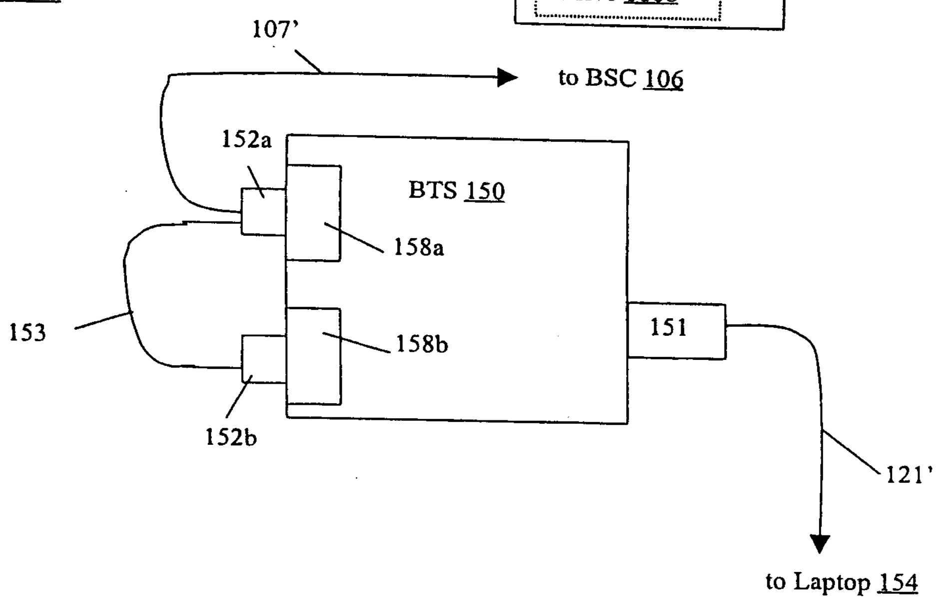


FIG. 3



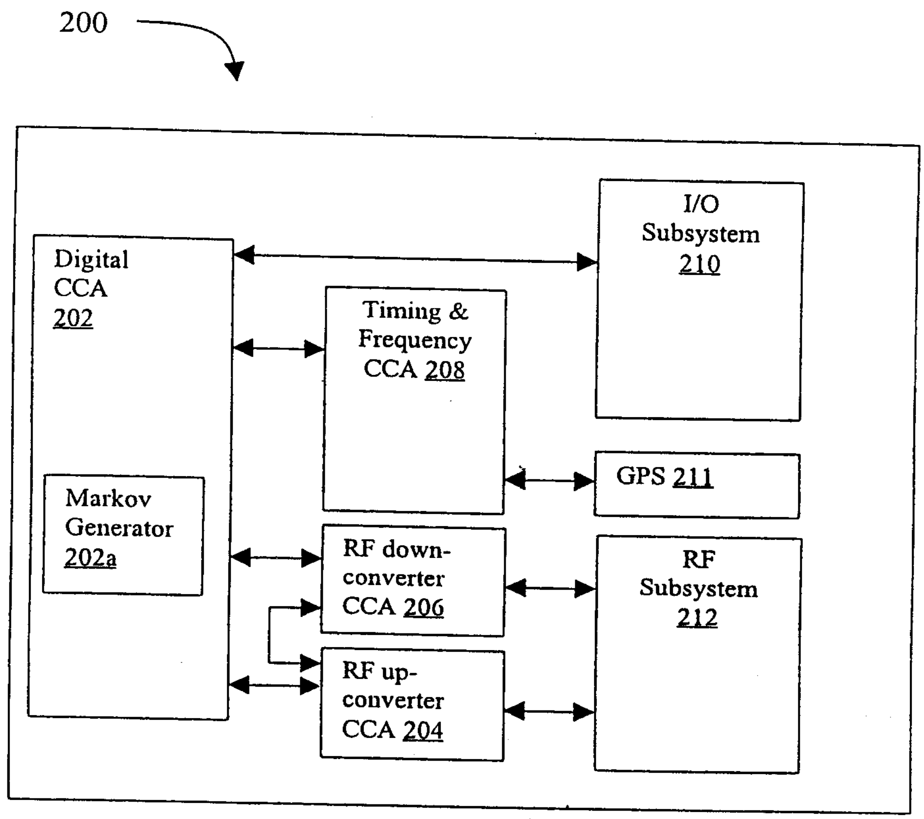
130
132
124
107
109
Base Station Transceiver Subsysem 104'
Scripts 120
Server 118
Telnet 133
UDP/TCP/IP 116
Shell Local Manager 114
PPP 122
RS232 Serial Port 123
ETHERNET Port 104a
121b
Laptop Computer 110
Display 110a
Web Browser 112
Drive 110b
121a

FIG. 4



107'
to BSC 106
152a
BTS 150
158a
153
158b
151
152b
121'
to Laptop 154

FIG. 5


200
Digital
CCA
202
Markov
Generator
202a
Timing &
Frequency
CCA 208
I/O
Subsystem
210
GPS 211
RF down-
converter
CCA 206
RF up-
converter
CCA 204
RF
Subsystem
212

INTERNATIONAL SEARCH REPORT

Int. ational Application No
PCT/US 99/03972

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04Q7/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04Q H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KING B ET AL: "SIMPLE DOWN LOAD INTERFACE FOR GSM EQUIPMENT" MOTOROLA TECHNICAL DEVELOPMENTS, vol. 28, 1 August 1996, pages 167-169, XP000638462 see the whole document ---	1,9,16, 25
A	WO 96 24230 A (ERICSSON TELEFON AB L M) 8 August 1996 see page 2, line 8 - page 3, line 9 see page 6, line 26 - page 7, line 31 --- -/--	1,9,25, 26

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 June 1999	15/07/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bernedo Azpiri, P

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INTERNATIONAL SEARCH REPORT

Inte..ational Application No
PCT/US 99/03972

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	MING-YI LEE ET AL: "A Java-based wireless network management system" 1997 IEEE INTERNATIONAL CONFERENCE ON PERSONAL WIRELESS COMMUNICATIONS (CAT. NO.97TH8338), 1997 IEEE INTERNATIONAL CONFERENCE ON PERSONAL WIRELESS COMMUNICATIONS CONFERENCE PROCEEDINGS, MUMBAI, INDIA, 17-19 DEC. 1997, pages 353-356, XP002106546 ISBN 0-7803-4298-4, 1997, New York, NY, USA, IEEE, USA see page 353, right-hand column, line 8 - line 24 see page 353, right-hand column, line 36 - page 354, left-hand column, line 4 ---	2,32
A	US 5 410 753 A (SZABO LASZLO) 25 April 1995 see the whole document ---	19
A	LUNDQVIST R: "TEMS - A SYSTEM FOR TESTING AND MONITORING AIR INTERFACES" 1 January 1996 , ERICSSON REVIEW, VOL. 73, NR. 1, PAGE(S) 34 - 44 XP000584599 see page 40, right-hand column, line 15 - line 49 -----	19

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 99/03972

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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